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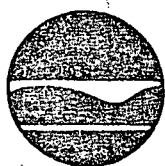
HEALTH RISK ASSESSMENT
Baseline Public Health Evaluation
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

July 1987

TAMS CONSULTANTS, Inc.

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1. INTRODUCTION

TAMS CONSULTANTS, Inc. and Goldberg-Zoino & Associates, Inc. (GZA), acting as Remedial Investigation/Feasibility Study (RI/FS) Consultants to the New York State Department of Environmental Conservation (NYSDEC), have provided this Health Risk Assessment. It provides a baseline public health evaluation of domestic water use from the Ranney Well Collector Well in the Village of Endicott, New York, based on present conditions. A public health analysis of remedial alternatives, including a detailed evaluation of the recommended alternative, is included as part of the Endicott Wellfield Feasibility Study.

Contamination of the Ranney Well was first documented in May 1981 by the USEPA when 8.4 ug/l of vinyl chloride and trace levels of other organics were found in the water. Subsequent sampling in February 1982 showed continued vinyl chloride contamination at a slightly reduced concentration of 7.5 ug/l (Ecological Analysts, 1984). In addition, several other volatile organic contaminants have been detected in Ranney Well samples, including trans-1,2-dichloroethene; chloroethane; chloromethane; 1,1- and 1,2-dichloroethane; 1,1,1-trichloroethane; trichloroethene; 1,1-dichloroethene; chloroethane; methylene chloride; trihalomethanes; dichlorodifluoromethane and trichlorofluoromethane. Although the specific source of contamination has not yet been pinpointed, a generalized source west of the Ranney Well has been thus far determined during the Remedial Investigation.

To reduce volatile organic concentrations in Ranney Well drinking water, a number of contaminant reduction measures have been implemented to date. These include:

- ° Four of the western lateral collectors, having the highest levels of organic contamination, have been shut down.
- ° A purge well has been installed to the west of the Ranney Collection Well in order to reduce the influx of contaminated water to the Ranney Well. The purge well, which has been pumping at a rate of about 600 gpm since February 1985, discharges ultimately to Nanticoke Creek via a pair of intermediate lagoons.
- ° Diffused air aeration equipment has been installed in the well to air strip vinyl chloride and other volatile organic contaminants. This treatment scheme (diffused air in conjunction with purge well operation) has reduced the levels of vinyl chloride contamination to a range of none detected to 3 ug/l.
- ° Observation wells have been installed in an effort to locate the source of contamination and groundwater movement.

2. METHODOLOGY

The baseline public health evaluation for the Ranney Well is primarily based on previous site reports by Ecological Analysts, Inc. (1984); Kudgus (1983); chemical analytical data from Ranney Well samples for the period during which the current treatment scheme has been in operation (February 1985 to date); and data collected during the Remedial Investigation.

The evaluation methodology follows that provided in the USEPA Draft Superfund Public Health Evaluation Manual (1985a). The evaluation is supplemented by procedures, guidelines and directives provided in specific EPA publication, in the Federal Register, and in scientific and toxicological literature.

Typically, the public health evaluations process involves the determination of significant contaminant migration routes and exposure pathways, identification of the hazardous compounds of greatest concern, and an assessment of possible effects in light of probable exposure scenarios. Several factors must be considered during this process. These include:

- ° Present site conditions, as defined by previous investigations and pertinent historical data, including chemical analyses.
- ° Physical, chemical, and biological variables affecting the environmental fate and mobility of contaminants.
- ° Potential receptors and their likelihood of exposure and susceptibility to those compounds.
- ° Effects associated with exposure to those compounds, including any ascertainable additive, synergistic, or inhibitory effects.

Any limitations to the extent to which these factors can be evaluated will limit the scope of the assessment and the conclusions which can be deduced. The major limitations of this public health evaluation might be due to: (1) constraints imposed by the chemical analytical procedures (i.e., the lack of specificity of the data as it relates to contaminant detection and quantification at or near the detection limits); (2) the validity and applicability of the chemical analytical data; (3) the relevance of toxicological data to site specific exposure scenarios; (4) the degree to which probabilities of exposure may be estimated or predicted; (5) the lack of health risk data for some of the compounds detected in Ranney Well samples; and (6) the validity of the numerical carcinogenic potency and acceptable intake values.

3. FINDINGS

Table 1 provides a list of organic contaminants detected in the Ranney Well. All compounds detected in the Ranney Well were evaluated for public health effects. However, to provide a quantitative risk assessment, indicator chemicals were selected. These are discussed below.

3.1 Indicator Chemicals

Development of a quantitative Risk Assessment for Endicott requires the selection of appropriate indicator chemicals. The selection decision for including a particular compound in the quantitative calculations for toxicity or carcinogenicity was based on the following three criteria: (1) The chemical must have been detected in at least one valid analysis within the time period of the current treatment scheme (February 1985 to present); (2) the chemical must have known toxic or carcinogenic effects; and (3) there must be quantitative data available for the toxicity or carcinogenicity for the chemical.

The existence of available quantitative data refers to toxicity and carcinogenicity values established by USEPA's Environmental Criteria and Assessment Office (USEPA, 1985b). These values were specifically developed for conducting Health Risk Assessments at Superfund Sites. A qualitative assessment (based on other sources) of the health effects of contaminants for which ECAO has not developed values is given later (Section 3.4.2).

Since there are no specific quantitative data on the trihalomethanes bromoform, dibromochloromethane and bromodichloromethane, these compounds were evaluated as an equivalent of chloroform. No quantitative data is currently available on trans-1,2-dichloroethene, which was the most consistently detected contaminant. USEPA's ECAO personnel were unwilling to provide an order-of-magnitude estimate on the oral toxicity or carcinogenicity of this compound (Dr. Chris DeRosa, verbal communication, December 1986). Therefore, it was not possible to include trans-1,2-dichloroethene in the quantitative risk assessment. Chloromethane is a possible human carcinogen, but data, especially on ingestion, is limited. It was therefore not possible to include chloromethane in the quantitative risk assessment.

Toxicity/carcinogenicity values do not exist for ingestion of 1,1-dichloroethene or methylene chloride; therefore, no quantitative assessment of risk associated with ingestion of these compounds could be made. However, carcinogenic potency values have been determined for inhalation of these compounds, so these risks associated and compounds were quantified for this pathway.

The fluorocarbons (dichlorodifluoromethane and trichlorofluoromethane) were eliminated on the basis of criteria 2 and 3.

Compounds selected for quantitative assessment based on the above criteria were grouped according to toxicity or carcinogenicity. These are provided in Table 2.

3.2 Applicability of Chemical Data

One of the major factors involved in evaluating the risk calculations is the chemical data on which these calculations are based. The applicability of

TABLE 1
CONTAMINANTS DETECTED AT RANNEY WELL

	QUANTIFIABLE DETECTIONS		MAXIMUM CONCENTRATION		MEAN CONCENTRATION		CLASSIFI- CATION (NOTE 1)	TOXICITY/ CARCINO- GENICITY DATA EXISTS
	TOTAL	VALID	TOTAL	VALID	TOTAL	VALID		
1,1-Dichloroethane	19	16	13	13	0.65	0.66	T	Yes
1,2-Dichloroethane	1	1	2	2	0.03	0.04	C	Yes
trans-1,2-Dichloroethane	38	33	8	4	1.52	1.40	Note 2	No
Vinyl chloride	12	11	3	3	0.27	0.29	C	Yes
1,1,1-Trichloroethane	12	9	24	24	0.80	0.68	T	Yes
1,1,2-Trichloroethane	1	1	2	2	0.03	0.04	C	Yes
Trichloroethylene	17	14	2	2	0.33	0.32	C	Yes
1,1-Dichloroethane	3	3	19	19	0.40	0.45	Note 3	Note 3
Chloroethane	6	4	2	2	0.13	0.09	N	N/A
Chloromethane	2	2	5	5	0.15	0.17	Note 2	No
Methylene chloride	4	3	2	2	0.08	0.08	Note 3	Note 3
Tetrachloroethane	1	1	2	2	0.03	0.04	C	Yes
Chloroform	23	19	81	81	1.98	2.13	C	Yes
Other Trihalomethanes	10	8	7	7	0.42	0.42	Note 4	Note 4
Bromodichloromethane	(9)	(8)	(4)	(4)	(0.27)	(0.26)	Note 4	Note 4
Dibromochloromethane	(2)	(1)	(2)	(2)	(0.05)	(0.04)	Note 4	Note 4
Bromoform	(1)	(1)	(5)	(5)	(0.08)	(0.09)	Note 4	Note 4
Dichlorodifluoromethane	2	1	3	3	0.19	0.14	ND	No
Trichlorofluoromethane	4	3	2	2	0.08	0.07	ND	No

All concentrations in ug/l (ppb).

Analyses by Friend Laboratories, Waverly, NY.

Data from 60 most recent (53 valid) analyses since purge well and diffused air operational, February 1985 - June 1987.

Notes:

- (1) T : Toxic
- C : Carcinogenic
- ND : Not determined
- N : No evidence of toxicity or carcinogenicity

(2) Still under study; probable carcinogen.

(3) Carcinogen via inhalation; no ingestion (oral) data available.

(4) Carcinogenicity for trihalomethanes calculated as chloroform.

TABLE 2

CONTAMINANTS EVALUATED IN QUANTITATIVE
RISK ASSESSMENT OF RANNEY WELL WATER

A. TOXINS	Acceptable Intake Concentrations		Maximum Concentration (Valid Data)	Mean Concentration (Valid Data)	Mean Concentration (All Data)	Maximum Contaminant Level (MCL)	MCLG
	Subchronic	Chronic					
1,1-Dichloroethane	40,000	4,000	13	0.66	0.65	-	-
1,1,1-Trichloroethane	ND	19,000	24	0.68	0.80	200*	200

B. CARCINOGENS	Concentration at 10 ⁻⁶ Cancer Risk	Carcinogenic Potency (kg day/mg)	Maximum Concentration (Valid Data)	Mean Concentration (Valid Data)	Mean Concentration (All Data)	Maximum Contaminant Level (MCL)	MCLG
Vinyl chloride	0.015	2.3	3	0.29	0.27	2*	0
1,2-Dichloroethane	0.51	0.069	2	0.038	0.033	5*	0
Trichloroethene	3.2	0.011	2	0.32	0.33	5*	0
Total Trihalomethanes (as chloroform)	0.50	0.07	81	2.55	2.40	100	-
Tetrachloroethene	0.87	0.040	2	0.038	0.033	-	-
1,1,2-Trichloroethane	0.61	0.057	2	0.038	0.033	-	-

Notes:

All data in ug/l (ppb) except as noted.

Toxicity and Carcinogenicity values from USEPA, Toxicity Values for Use at Superfund Remedial Sites, July 18, 1985; except values for trichloroethene based on update from EPA (Karen Blackburn, ECAO, telephone conversation, March 4, 1987). Values cited are for ingestion.

Maximum Contaminant Levels from Safe Drinking Water Act, 40 CFR 141.12.

Analytical Data From Table 1.

* Final value under Safe Drinking Water Act, signed June 19, 1987; to be included as 40 CFR 141.61(a).

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the data is in turn based on several considerations, including: (1) existence of sufficient analyses; (2) detection limit for contaminants of concern; (3) validity of data; (4) existence of quantitative toxicity or carcinogenicity data, to enable meaningful comparisons and calculations to be made; and (5) relevance of existing data to anticipated receptor exposure. These considerations are discussed below.

3.2.1 Existence of Sufficient Analyses

There is no lack of data from the Endicott Wellfield. Analyses (by USEPA Method 601 - purgeable halocarbons) have been conducted on samples taken every two weeks for four the past years. For the purpose of consistency, only the analyses by Friend Laboratories have been utilized in the calculations; and only the data collected during the current treatment scheme (purge well and diffused air operational) was selected as being most indicative of current contaminant levels. This data is summarized in Table 3. Data from the most recent one-year period are tabulated in Table 4 in order to see if any obvious trends were noticeable. The purge well has been pumping at an estimated 600 gallons per minute throughout this period.

Despite the frequency of sampling, the analyses were conducted only for a limited number of contaminants. USEPA Method 601 analytes and detection limits are listed in Table 5. Other non-volatile, semi-volatile, and volatile contaminants (e.g., benzene) which, if present would increase the risk associated with use of Ranney Well water, are not detected by the analytical method used. A full hazardous substance list (HSL) organics analysis (by Weston Laboratories on a Remedial Investigation sample from 7/23/86) detected toluene at a low concentration (estimated as 1.0 ug/l), but no other previously undetected contaminants were detected. However, the detection limit for the HSL organics analysis is relatively high.

3.2.2 Detection Limits

The reported detection for USEPA Method 601 (purgeable halocarbons by gas chromatography) by Friend Laboratories was 1 ug/l (1.0 ppb) for all parameters. Although EPA reports a method detection of substantially less than this for virtually all Method 601 analytes, few if any laboratories report these lower detection levels. In addition, Friend Laboratory does not estimate concentrations below the reportable detection limit, although a particular compound may have been detected. For the purpose of risk assessment calculations, all detections lower than the detection limit, as well as all samples where no compounds were detected, were assigned a value of zero. The HSL organics analysis by Weston (USEPA Methods 624 and 625) essentially confirmed that the ongoing Ranney Well monitoring by USEPA Method 601 is appropriate. However, it is possible that some of these contaminants may be present at levels below the method detection limit (generally 5 to 10 ug/l for volatiles, and 10 to 50 ug/l for semi-volatiles [base-neutrals and acid extractables]), although there is no reason to suspect their presence in the well at this time. GC/MS analyses, such as Weston's HSL analysis, have the advantage of being more certain in compound identification; however, GC/MS analyses typically have higher detection limits than GC only methods (such as USEPA Method 601).

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Table 3

ENHANCED WELLFIELD PROJECT
 FREESTONE LABORATORY - BANNET WELLS, INC. DATA
 February 1984 through June 1987
 Purge well purging & BTC gas and diffused air operations:
 All results in ug/l (ug/l)

DATE	VINYL CHLORIDE	TRANS-1,2- DICHLORO- ETHYLENE	1,1- DICHLORO- ETHANE	TRICHLORO- ETHYLENE	1,1,1- TRICHLORO- ETHANE	CHLOROFORM	OTHER TRIALKO- NETHANES	HEMPYLENE CHLORIDE	1,1- DICHLORO- ETHYLENE	1,2- DICHLORO- ETHANE	CHLORO- ETHANE	NOTES
12-Feb-85	0	2	0	0	0	0	0	0	0	0	0	
26-Feb-85	0	0	0	0	0	0	0	0	0	0	0	
12-Mar-85	3	0	0	0	3	0	0	0	0	0	0	
26-Mar-85	1	2	0	0	0	0	0	0	0	0	0	
09-Apr-85	0	2	0	0	0	0	0	0	0	0	0	
23-Apr-85	0	3	0	0	0	0	0	0	0	0	0	
07-May-85	0	0	0	0	0	0	0	0	0	0	0	
21-May-85	0	0	0	0	2	0	0	0	0	0	0	
04-Jun-85	0	0	0	0	0	0	0	0	0	0	0	
18-Jun-85	0	0	0	0	0	0	0	0	0	0	0	
02-Jul-85	0	0	0	0	24	0	0	0	0	0	0	TETRACHLOROMETHANE: 2 ug/l
16-Jul-85	0	0	0	0	0	0	0	0	0	0	1	
30-Jul-85	0	0	0	0	0	0	0	0	0	0	1	HOLDING TIME EXCEEDED
13-Aug-85	0	0	0	0	1	0	0	0	0	0	1	
07-Sep-85	1	0	0	0	0	0	0	0	0	0	2	HOLDING TIME EXCEEDED
27-Sep-85	1	0	1	0	0	0	0	0	0	0	0	
01-Oct-85	0	0	13	0	0	0	0	0	0	0	0	
15-Oct-85	0	3	0	1	0	0	0	0	3	0	2	
29-Oct-85	0	0	2	0	2	3	0	0	0	0	0	
12-Nov-85	0	0	0	0	0	0	0	0	19	0	0	CC13F: 1 ug/l
26-Nov-85	0	0	0	1	0	5	0	0	0	0	0	
10-Dec-85	0	0	1	1	0	0	0	0	0	0	0	
23-Dec-85	0	0	3	0	0	0	0	0	0	0	0	
06-Jan-86	0	2	1	1	0	0	0	0	0	0	0	
21-Jan-86	0	2	0	1	0	0	0	0	0	0	0	
04-Feb-86	0	1	0	0	0	0	0	1	0	0	0	
18-Feb-86	0	2	0	0	0	0	0	0	0	0	0	
04-Mar-86	0	2	1	1	1	0	0	1	0	0	0	CC13F: 1 ug/l; HOLDING TIME EXCEEDED
18-Mar-86	0	0	1	0	10	1	0	0	0	0	0	HOLDING TIME EXCEEDED
01-Apr-86	1	2	1	0	0	2	1	1	0	0	1	
15-Apr-86	0	2	1	1	0	1	1	0	0	0	0	
29-Apr-86	3	2	1	1	0	0	1	2	0	2	0	
13-May-86	1	0	0	1	0	1	0	0	0	0	0	
27-May-86	2	2	1	1	1	3	4	0	0	0	0	
10-Jun-86	0	3	1	2	1	2	4	0	0	0	0	CC13F: 1 ug/l
24-Jun-86	0	3	1	0	0	2	0	0	0	0	0	
08-Jul-86	0	2	0	1	0	1	1	0	0	0	0	HOLDING TIME EXCEEDED
22-Jul-86	1	3	1	0	0	2	1	0	0	0	0	
05-Aug-86	0	2	0	0	0	1	0	0	0	0	0	
19-Aug-86	0	0	0	0	0	0	0	0	0	0	0	
02-Sep-86	0	3	2	1	1	2	0	0	0	0	0	HOLDING TIME EXCEEDED
16-Sep-86	0	4	2	2	0	1	0	0	0	0	0	
30-Sep-86	0	2	0	0	0	2	2	0	0	0	0	CC12F2: 2 ug/l; HOLDING TIME EXCEEDED
14-Oct-86	0	2	0	0	0	2	2	0	0	0	0	CC12F2: 3 ug/l
28-Oct-86	0	2	0	0	0	1	0	0	0	0	0	
11-Nov-86	0	0	2	0	0	0	0	0	0	0	0	
01-Dec-86	0	4	0	2	0	1	2	0	0	0	0	1,1,2-TRICHLOROETHANE: 2 ug/l
09-Dec-86	0	0	0	0	0	0	0	0	0	0	0	
23-Dec-86	1	3	0	0	0	0	0	0	0	0	0	
06-Jan-87	0	0	0	0	0	2	0	0	0	0	0	
17-Feb-87	0	2	3	1	1	0	0	0	2	0	0	VINYL CHLORIDE PRESENT: 45 ug/l; CC13F: 2 ug/l; CHLOROMETHANE: 5 ug/l
03-Mar-87	0	1	0	0	0	0	0	0	0	0	0	
10-Mar-87	1	2	0	0	0	0	0	0	0	0	0	CHLOROMETHANE: 0 ug/l
31-Mar-87	0	2	0	0	1	1	0	0	0	0	0	
07-Apr-87	0	2	0	0	0	0	0	0	0	0	0	
14-Apr-87	0	2	0	1	0	1	0	0	0	0	0	
20-Apr-87	0	2	0	0	0	0	0	0	0	0	0	
17-May-87	0	2	0	0	0	0	0	0	0	0	0	
27-May-87	0	2	0	0	0	0	0	0	0	0	0	
09-Jun-87	0	2	0	0	0	1	0	0	0	0	0	
MLL DATA												
AVERAGE	0.271	1.517	0.650	0.353	0.800	1.983	0.417	0.083	0.400	0.033	0.133	CHLOROMETHANE: 0.15 ug/l
N	59	60	60	60	60	60	60	60	60	60	60	
TRIS DATA												
AVERAGE	0.238	1.396	0.600	0.321	0.679	2.132	0.415	0.075	0.453	0.038	0.094	CHLOROMETHANE: 0.17 ug/l
N	52	53	53	53	53	53	53	53	53	53	53	

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TABLE 4

ENDICOTT WELLFIELD PROJECT
FRIEND LABORATORY - RANNEY WELL #32 DATA
June 1986 through June 1987
All results in ug/L (ppb)

DATE	VINYL CHLORIDE	TRANS-1,2- DICHLORO- ETHYLENE	1,1- DICHLORO- ETHANE	TRICHLORO- ETHYLENE	1,1,1- TRICHLORO- ETHANE	CHLOROFORM	OTHER TRIHALO- METHANES	METHYLENE CHLORIDE	1,1- DICHLORO- ETHENE	1,2- DICHLORO- ETHANE	CHLORO- ETHANE	NOTES
10-Jun-86	0	3	1	2	1	2	4	0	0	0	0	
24-Jun-86	0	3	1	0	0	2	0	0	0	0	0	
08-Jul-86	0	2	0	1	0	1	1	0	0	0	0	HOLDING TIME EXCEEDED
23-Jul-86	1	3	1	0	0	2	1	0	0	0	0	
05-Aug-86	0	2	0	0	0	1	0	0	0	0	0	
19-Aug-86	0	0	0	0	0	0	0	0	0	0	0	
02-Sep-86	0	3	2	1	1	2	0	0	0	0	0	HOLDING TIME EXCEEDED
16-Sep-86	0	4	2	2	0	1	0	0	0	0	0	
30-Sep-86	0	2	0	0	0	2	2	0	0	0	0	CC12F2: 2 ug/l; HOLDING TIME EXCEEDED
15-Oct-86	0	2	0	0	0	2	2	0	0	0	0	CC12F2: 3 ug/l
28-Oct-86	0	2	0	0	0	1	0	0	0	0	0	
13-Nov-86	0	0	2	0	0	0	0	0	0	0	0	
01-Dec-86	0	4	0	2	0	1	2	0	0	0	0	1,1,2-TRICHLOROETHANE: 2 ug/l
09-Dec-86	0	0	0	0	0	0	0	0	0	0	0	
23-Dec-86	1	3	0	0	0	0	0	0	0	0	0	
06-Jan-87	0	0	0	0	0	2	0	0	0	0	0	
17-Feb-87	4	2	3	1	1	0	0	0	2	0	0	VINYL CHLORIDE PRESENT, <5 ug/l; CC13F: 2 ug/l; CHLOROMETHANE: 5 ug/l
03-Mar-87	0	1	0	0	0	0	0	0	0	0	0	
18-Mar-87	1	2	0	0	0	0	0	0	0	0	0	CHLOROMETHANE: 4 ug/l
31-Mar-87	0	2	0	0	0	1	0	0	0	0	0	
07-Apr-87	0	2	0	0	0	0	0	0	0	0	0	
14-Apr-87	0	2	0	1	0	1	0	0	0	0	0	
28-Apr-87	0	2	0	0	0	0	0	0	0	0	0	
12-May-87	0	2	0	0	0	0	0	0	0	0	0	
29-May-87	0	2	0	0	0	0	0	0	0	0	0	
09-Jun-87	0	2	0	0	0	1	0	0	0	0	0	
ALL DATA:												
AVERAGE	0.120	2.000	0.462	0.385	0.154	0.846	0.462	0.000	0.077	0.000	0.000	CHLOROMETHANE: 0.35 ug/l
N	25	26	26	26	26	26	26	26	26	26	26	
VALID DATA:												
AVERAGE	0.136	1.957	0.435	0.348	0.130	0.739	0.391	0.000	0.087	0.000	0.000	CHLOROMETHANE: 0.39 ug/l
N	22	23	23	23	23	23	23	23	23	23	23	

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TABLE 5
EPA METHOD 601 ANALYTES AND METHOD DETECTION LIMITS

PARAMETER	METHOD DETECTION LIMIT (UG/L)
Chloromethane	0.08
Bromomethane	1.18
Dichlorodifluoromethane	1.81
Vinyl chloride	0.18
Chloroethane	0.52
Methylene chloride	0.25
Trichlorofluoromethane	ND
1,1-Dichloroethene	0.13
1,1-Dichloroethane	0.07
trans-1,2-Dichloroethene	0.10
Chloroform	0.05
1,2-Dichloroethane	0.03
1,1,1-Trichloroethane	0.03
Carbon tetrachloride	0.12
Bromodichloromethane	0.10
1,2-Dichloropropane	0.04
cis-1,3-Dichloropropene	0.34
Trichloroethene	0.12
Dibromochloromethane	0.09
1,1,2-Trichloroethane	0.02
trans-1,3-Dichloropropene	0.20
2-Chloroethylvinyl ether	0.13
Bromoform	0.20
1,1,2,2-Tetrachloroethane	0.03
Tetrachloroethene	0.03
Chlorobenzene	0.25
1,3-Dichlorobenzene	0.32
1,2-Dichlorobenzene	0.15
1,4-Dichlorobenzene	0.24

EPA Method 601 from 40 CFR 136, Appendix A

ND = Not determined.

3.2.3 Validity of Data

The Friend Laboratory data were not subjected to rigorous quality assurance (QA) scrutiny. However, the data were examined to see if the analyses were performed within the 14 day holding time allowed by USEPA Method 601. On this basis, data from 7 of the 60 most recent analyses were rejected (invalidated).

Although application of the 14 day holding time requirement may seem arbitrary and unduly rigorous (data from analyses conducted 14 days after sample collection was used as valid, whereas data from analyses performed 15 days after sample collection was invalidated), samples held for an excessive time prior to analysis are subject to degradation. Loss of highly volatile compounds (e.g., vinyl chloride) may occur, and contamination from laboratory solvents (e.g., methylene chloride) may be introduced into samples held too long in the laboratory.

The compound 1,1-dichloroethene (1,1-DCE) was detected at a high concentration in one Ranney Well sample (11/12/85). Although this sample was analyzed within the allowable holding time, this data point may be considered as spurious on both statistical and logical grounds. Statistically, the 1,1-DCE concentration reported (19 ug/l) is more than four standard deviations (1 SD = 2.46) from the arithmetic mean (0.45 ug/l), which has less than 0.1% change of occurring in a normal distribution of data (Mosteller, 1970). In addition, 1,1-DCE is rarely detected in samples from the purge well, and in the few samples in which it was detected, the concentrations were well below 19 ug/l. Since the purge well intercepts the contaminant plume before it reaches the Ranney Well, contaminant concentrations in well should logically be much lower than those in the purge well. Therefore, the 19 ug/l 1,1-DCE reported for the 11/12/85 sample is unreasonable, as well as being statistically unlikely.

Similarly, the one high concentration of chloroform (81 ug/l on 10/15/85; SD = 10.3) as well as unusually high levels of 1,1-dichloroethane (13 ug/l on 10/1/85; SD = 1.8) and 1,1,1-trichloroethane (24 ug/l on 7/2/85; SD = 3.3) are suspect. However, to be conservative, all data from analyses performed within the requisite holding time were included in the risk assessment; since the assumption a normal distribution of data may not be valid.

3.2.4 Existence of Quantitative Toxicity/Carcinogenicity Data

Regardless of the amount or quality of analytical data, a quantitative assessment of risk cannot be made without toxicity or carcinogenicity values for the compounds of interest. Fortunately, for most of the contaminants detected in Ranney Well samples, USEPA has established these values. The major exception to this is trans-1,2-dichloroethene, which was the most consistently detected compound (found in over 53 percent of all Ranney samples since February 1985) and at the highest levels of any contaminant recently (averaging 2.0 ug/l since June 1986).

Ingestion risk data does not exist for chloromethane or methylene chloride; however, due to the relatively low concentrations and infrequency of detection, the absence of ingestion risk values for these compounds is not felt to be a major drawback. This is discussed more fully in this assessment (3.4.2).

The vinyl chloride concentration established by USEPA's ECAO as corresponding to a 10^{-6} cancer risk is 0.015 ug/l (15 parts per trillion) (USEPA, 1985b). This value is substantially lower than the values previously developed by USEPA's Carcinogenic Assessment Group (CAG) (2.0 ug/l) and the National Academy of Sciences (1.0 ug/l) (Sittig, 1965) for an equivalent risk.

3.2.5 Relationship of Ranney Well Analytical Data to Receptor Exposure

The analytical data from the Ranney Well is expected to be a reasonable predictor of receptor exposure. The samples are taken after aeration, which is expected to be the step of the treatment process having a significant effect on the concentration of volatile organics in the water supply. Small losses of volatiles during chlorination and end use at the tap may occur, although no losses due to dilution, volatilization, or other causes are anticipated within the distribution system. There is a possibility of additional trihalomethane formation during chlorination, although this is not thought to be significant. However, the magnitude of this effect, as well as that of volatile organics losses, cannot be evaluated without a separate domestic tap water sampling program.

3.3 Routes of Exposure

An exposure pathway is a route a contaminant may take to reach a susceptible receptor. In order for an exposure pathway to be complete, three factors must be present: (1) a source of contamination, (2) a route of contaminant transport, and (3) a receptor which may be exposed to the contaminants.

The mode and duration of exposure will influence the risks to a receptor. Modes of exposure are usually categorized as ingestion (oral), inhalation, and direct (dermal) contact. Ingestion may take the form of direct exposure through drinking or eating contaminated food and water, or may involve indirect routes such as use of contaminated water for food preparation. Direct inhalation exposure results from breathing air which has become contaminated through volatilization, release of gas-phase contaminants, or entrainment of airborne particulates. In the case of particulate inhalation, the physical size of the particulates as well as their chemical characteristics play a major role in determining the importance of the exposure since only particulates within a certain size range (0.5 to 30 microns) are considered to be respirable. Dermal exposure may result from direct contact with contaminated water, soil or other material.

Exposure durations are separated into two main classes: (1) acute and sub-chronic exposure, which involves short-time duration and frequency; or (2) chronic exposure, which is of longer duration and is continuous or frequent.

A few general statements can be made regarding the probability that any of these routes of exposure will be significant at a hazardous waste site. Acute exposure by inhalation, dermal contact or ingestion would most likely be of concern at sites containing pure or contact high concentrations of contaminants such as occurs where bulk dumping was practiced or waste was stored in surface impoundments. Sites which have highly contaminated soil or water have increased risk of acute inhalation exposure from volatilized compounds and acute dermal exposure from direct contact with high concentrations of contaminants. Acute ingestion potential is minimal at this site.

Significant chronic exposures, however, are possible from relatively low concentrations of contaminants. Chronic dermal exposure is most likely to occur at sites which freely allow direct physical contact with contaminated soils, water or residuals. Chronic inhalation exposure could occur at sites that have continuous releases of volatile materials via open lagoons, surface water, or uncovered contaminated soils or wastes. Chronic ingestion is, in most cases (including this one), the major exposure route and is more likely to result from drinking contaminated water than from repeated ingestion of contaminants in the food chain, soils, or waste products.

3.3.1 Routes of Transport

The major contaminant transport paths having an effect on human and environmental receptors are:

- Transport via the movement of contaminated groundwater under the site. A plume of contaminated groundwater west of Ranney Well has been identified.
- Evaporation of volatile organic contaminants to the ambient air. Volatilization of organic contaminants from contaminated water at the purge well and associated lagoons; the Ranney Well head; and at household taps, is a potential route of contaminant transport at the site.
- Surface water transport of site contaminants, as well as precipitation, runoff, and infiltration that leaches contaminants from deposited wastes with subsequent contaminant migration. However, the possible effects of exposure via these pathways is beyond the scope of this report.

3.3.2 Receptors

The Ranney Well is one of four wells that service a population of approximately 45,000, and produces 6.0×10^6 gpd of a total of 12.7×10^6 gpd total production of four wells (approximately 47%) when all are operational. Based on the design characteristics of the water distribution system, it is assumed that 47% of the population (i.e., about 21,000 people) receive 100% of their water supply from the Ranney Well. At this time, there is no reason to assume an unusually sensitive receptor population or anything other than normal receptor population demographics.

3.3.2.1 Inhalation

No observed release of contaminant has been reported via air or surface water; therefore, it is assumed that these pathways do not currently present a risk of inhalation exposure. However, inhalation of volatilized contaminants is a possibility during various domestic and household activities, such as bathing, and washing of dishes and clothes. Should the source of contamination become known, the risk of inhalation may occur during excavation and cleanup procedures. Showering in particular presents a high potential for volatilization for several reasons:

- The relatively fine spray from a showerhead increases the interface area for liquid phase/gas phase transport of organics.
- The elevated temperatures of a hot shower also increases liquid-to-gas phase transport of volatile organics.

- The relatively large volume of water used for showering increases the quantity of contaminants that can potentially volatilize.
- The fact that showering tends to occur in an enclosed area (i.e., a bathroom with the door closed) reduces dissipation of volatiles such as vinyl chloride and tends to increase the concentration available for inhalation.

Inhalation of volatilized organics during showering is difficult to estimate. There is no standard EPA protocol for this, due to the difficulty in determining the transfer rate (liquid phase to vapor phase). Two different methods, referred to as the Henry's Law Model and the Complete Mass Transfer Model, were used to estimate this exposure. However, a mass balance calculation performed for the Henry's Law Model (using the same assumptions as for the Complete Mass Transfer Model) indicates that this value cannot be correct, since it requires a larger mass of vinyl chloride in the air than entered through the water. Therefore, the Henry's Law Model is inappropriate for this system.

Complete Mass Transfer Model

The complete mass transfer method assumes that all the vinyl chloride in the water is volatilized and diffused immediately. From this, the ambient concentration is calculated, and the dose determined. Estimates of breathing rate ($1.0 \text{ m}^3/\text{hr}$) duration of exposure (20 minutes), and adult body weight (70 kg) are those reported in the Exposure Assessment Manual (Versar, 1986a). It should be noted that estimates of these factors do vary (e.g., breathing rate ranges from 0.83 to $1.3 \text{ m}^3/\text{hr}$); however, variability of these factors is expected to have a relatively small impact on the risk determination.

In this model, exposure during showering was divided into two parts: exposure during actual showering (active showering), and exposure after showering (passive exposure).

Active showering exposure was calculated by assuming a duration of ten minutes and a total volume of 189 liters (10 minutes at 5.0 gallons/minute). It should be noted that other researchers use a substantially lower estimate of water volume (Andelman, 1985; Andelman et al., 1986). The area of diffusion during this phase was assumed to be the shower stall itself, having an area of 5.0 m^2 . The mean exposure concentration during this period is the average of the initial concentration (assumed to be zero) and the final air concentration (the total mass of vinyl chloride in 189 liters of water divided by the area, 5.0 m^2). Based on an inhalation rate of $1.3 \text{ m}^3/\text{hr}$ for the activity of showering (Versar, 1986b) and a tap water vinyl chloride concentration of 0.29 ug/l , dosage during this phase is estimated to be 1.18 ug .

The passive exposure phase is that spent in the bathroom after showering (drying, shaving, applying cosmetics, etc.). Estimates of this time range from 5 minutes to 35 minutes; however, 10 minutes was used as an estimated for this phase. (This results in a total exposure duration of 20 minutes, which is the same duration used in Henry's Law Model.) The vinyl chloride was assumed to be uniformly distributed throughout the entire bathroom, estimated to have an area of 12.5 m^2 . A breathing rate of $1.0 \text{ m}^3/\text{hr}$ for this period is assumed, as is no decrease in concentration due to diffusion or ventilation. (This assumption is most inaccurate for longer exposures; so

the maximum passive exposure probably substantially overestimates the dose.) Total dose incurred during this second ten-minute period is estimated to be 0.71 ug.

Based on the total exposure of 1.99 ug (1.18 ug plus 0.71 ug), the incremental cancer risk resulting inhalation of volatilized vinyl chloride during shower as calculated by the Complete Mass Transfer Model is 0.72×10^{-6} .

The Complete Mass Transfer model is probably very conservative (a high estimate). The risk from inhalation of vinyl chloride (0.72×10^{-6}) is about four percent of the risk of ingestion of vinyl chloride. Since vinyl chloride is the most volatile of the Ranney contaminants, inhalation risks due to the other contaminants were assumed to contribute the same or a smaller relative percentage to the corresponding ingestion risk.

Dermal absorption of vinyl chloride during showering must be assumed to be zero in order to be consistent with the assumptions of the Complete Mass Transfer Model. If less than complete mass transfer is assumed, the risk can be apportioned between the two pathways.

3.3.2.2 Dermal Contact

There are no present Federal regulations dermal exposure to chloride. The risk of significant dermal exposure is not indicated at this time. The only known dermal effects are of large quantities at high concentrations, producing frostbite-like symptoms on the affected area.

Dermal exposure, then, appears to be a potentially significant exposure pathway. Using the assumptions in the Superfund Exposure Assessment Manual and the methodology of Brown et al., the carcinogenic risk from dermal absorption of vinyl chloride during bathing was estimated to be 2.9×10^{-8} . (The risk due to dermal absorption of all contaminants is 3.6×10^{-8} .) The risk level is less than 0.2 percent of the oral (ingestion) risk, and is less than the dermal contribution to total risk estimated by Brown, Bishop, and Rowan (1984; cited in Versar, 1986a). Therefore, dermal exposure is not considered to be a significant pathway at Endicott.

Since contamination is believed to be confined to groundwater, dermal exposure during recreational exposure (e.g., swimming) to nearby surface water bodies was not calculated.

3.3.2.3 Ingestion

The major exposure path and subsequent health risk at the site is the ingestion of contaminated drinking water. The land in the Endicott Wellfield is non-agricultural; therefore, there is no apparent risk of food contamination.

The major contaminants detected in the wells were primarily volatile halogenated organics (halocarbons). As a class, volatile halocarbons are insoluble in water except at low concentrations and do not readily adsorb to soil particles. They are likely to migrate as a solute in groundwater.

For most of these compounds, chemical and biological processes are unlikely to attenuate the observed concentrations to a large extent. Volatilization is not likely within the water distribution system although volatilization (by aeration) is utilized to reduce contaminant levels prior to distribution.

Reduction can also occur by diffusion or dilution. Since Ranney Well water is distributed directly to users (following chlorination and fluoridation) via a closed system, no effects from diffusion or dilution are expected. There is the potential for trihalomethane (THM), especially chloroform, formation during chlorination; however, insufficient data exists to evaluate this possibility. Because of the relative proximity of the receptors to the site, it is assumed that minimal attenuation will occur between the Ranney Well sample location and the receptors.

Receptor exposure was calculated according to standard EPA methodology. The assumptions in this methodology are of a 70 kg (154 lb) adult consuming two liters (2.1 qt) of water daily for 70 years.

The potential for acute, chronic, and carcinogenic health risks associated with the ingestion of groundwater contaminants is discussed in the following sections.

3.4 Health Effects

Health effects are divided into three broad categories: Acute and Subchronic Effects; Chronic Health Effects; and Carcinogenic Risks. These effects are discussed below.

All carcinogenic data and most of the chronic and subchronic and acute effects values were derived from animal studies. A no-adverse-effects-level was determined and adjusted using appropriate uncertainty factors (usually 10 to 1000) to give the acceptable intake value. Acceptable intake values have not been established for potential carcinogens because of USEPA's position that all exposures are assumed to contribute to an increment of risk (USEPA, 1985a).

In the absence of these values for individual contaminants, toxicity and carcinogenicity were evaluated qualitatively based on data from other sources. The only compound consistently detected at Ranney Well for which no quantitative risk information could be obtained was trans-1,2-dichloroethene.

3.4.1 Quantitative Risk Assessment

3.4.1.1 Acute and Subchronic Health Effects

For non-carcinogenic chemicals, the estimated acceptable subchronic intake (AIS) has been estimated by ECAO. The AIS is defined as the highest short-term (10- to 90-day) exposure without any expected adverse health effects. Comparing the AIS to the estimated short-term intake level indicates whether health effects would be expected in the exposed population. The individual probability of effects (i.e., risk) resulting from exposures above the AIS cannot be estimated (USEPA, 1985b).

An additional measure of acute (1-day) and subchronic (10-day) toxic effects (where a threshold limit may exist) associated with ingestion of groundwater can be estimated by comparison of the observed concentrations of contaminants with the USEPA Health Advisory: Suggested No Adverse Response Levels (SNARLs) that are based on a 10-kg child who consumes one liter of water per day (USEPA, 1984).

No concentrations of groundwater contaminants which exceed the AIS or 1-day or 10-day SNARLS have been detected to date. Acute and subchronic health effects from ingestion of contaminated water is not a consideration at this time.

3.4.1.2 Chronic Health Effects

Chronic toxic effects (where a threshold limit may exist) may result from long-term repeated ingestion of groundwater contaminants. The criteria used to evaluate the potential for health impacts from chronic ingestion are the acceptable chronic intake (AIC) values (USEPA, 1985a). These values assume a 70-kg adult consuming two liters of water per day throughout a 70-year lifetime.

Exposure to subthreshold concentrations of the remaining detected contaminants could have associated additive or antagonistic effects. Additive effects are most likely to result from contaminants that induce the same health endpoint by the same toxic mechanism (USEPA, 1985a). The additive model is recommended by USEPA (USEPA, 1986) in the absence of known information on a mixture of contaminants.

The procedure determination of the possible existence of chronic toxic effects involves summing all the individual risk (from exposure to each of the contaminants), and then comparing the sum to 1.0. If the sum of the risks is greater than 1.0, then chronic health effects can be expected in the exposed population (although the magnitude, frequency, and severity cannot be estimated). If, on the other hand, the total toxic risk is less than 1.0, then adverse health effects are not anticipated (USEPA, 1985a).

The two toxic contaminants evaluated by the procedure were 1,1-dichloroethane and 1,1,1-trichloroethane. The total risk associated with ingestion of both the average and maximum concentrations of these compounds detected in recent Ranney Well samples is substantially less than 1.0. Therefore, no negative health effects are expected.

3.4.1.3 Carcinogenic Risk

Organic contaminants detected in Ranney Well samples which are known or suspected carcinogens include vinyl chloride, chloroform and other trihalomethanes, 1,2-dichloroethane, trans-1,2-dichloroethene, methylene chloride, 1,1,2-trichloroethane, tetrachloroethylene, and trichloroethene. Contaminants include those that are known to be carcinogenic or that may reasonably be anticipated to be carcinogens. The particular compounds chosen for evaluation were vinyl chloride, chloroform and other trihalomethanes, 1,2-dichloroethane, 1,1,2-trichloroethane, tetrachloroethylene, and trichloroethene. The rationale for the selection of those compounds was provided in Section 3.1 of this evaluation.

Carcinogenic potency is defined as the upper 95% confidence limit of the amount of risk per unit of exposure. Therefore, multiplication of the carcinogenic potency in inverse intake units (kg-day/mg) by the estimated long-term intake in corresponding units (mg/kg-day) will yield an upper-bound carcinogenic risk estimate.

Risk estimates were calculated for the mean and valid mean concentrations for both the most recent year and for the period during which the current treat-

ment system has been in operation (2/85 to present) to provide a range of risk estimates. The concentrations detected in the Ranney Well samples and used in the calculations are assumed to be the concentrations to which receptors are exposed.

The non-threshold model, which is linear at low doses, has been adopted as the primary basis for risk extrapolation to low level of dose-response relationship for individual contaminants. Although limited, it is the best of any of the current mathematical extrapolation models. Any risk estimates made with such a model should be regarded as conservative, representing the plausible upper limit for the risk; i.e., the true risk is not likely to be higher than the estimate, but it could be lower (USEPA, 1984).

Uncertainties are associated with the carcinogenic risk estimates for the various chemicals. They are introduced because of (a) the need to extrapolate below the dose range of the experimental (animal test) data; (b) the variability of the receptor population; (c) comparison of animal dose equivalency to human exposure; (d) the selection of appropriate animal studies, the cancer risk estimation used, and the route of exposure in the test animals may be different than the one expected in site-specific circumstances; and (e) the fact that the estimated risk is a probability conditional to the assumption that an animal carcinogen is also a human carcinogen.

In order to clarify the limitations inherent in using animal test data for cancer risk assessment, the following quotation is given:

The risk - likelihood of developing cancer - depends on the intensity, route, and duration of exposure to a carcinogen. Individuals may respond differently to similar exposure, depending on host factors such as age, sex, nutritional status, overall health, and inherited characteristics. Only in a few instances, where [there is data from] studies of long-term human exposures and cancer incidence in restricted environments, can risk be estimated with confidence (USDHHS, 1983).

To assess the total risk posed by the presence of more than one known or suspected carcinogen, risk estimates calculated for single contaminants are added (USEPA, 1986). Provided below is a tabulation of estimated lifetime cancer risks associated with chronic ingestion of the contaminants found in Ranney Well samples. The calculated values in the tabulation are limited to those compounds for which values have been established by the ECAO in a series of Health Effects Assessment (HEA) documents (USEPA, 1985b). Lifetime cancer risk calculations are based on the ECAO estimated carcinogenic potency factors.

Basis	Ingestion Carcinogenic Risk (Total)	
	(2/85-6/87)	(6/86-6/87)
Mean Concentration (All Data) -	23.1 x 10 ⁻⁶	10.8 x 10 ⁻⁶
Mean Concentration (Valid Data) -	24.6 x 10 ⁻⁶	11.6 x 10 ⁻⁶

Risk addition assumes (1) individual intakes are small, (2) there are no synergistic or antagonistic chemical interactions, (3) individuals will be exposed to all contaminants detected, and (4) all of the compounds induce carcinogenic effects in humans (USEPA, 1985b).

It should be noted that, depending on the basis of calculation, vinyl chloride contributes 75 to 80 percent of the total carcinogenic risk.

3.4.2 Qualitative Risk Assessment

Provided below is a qualitative public health evaluation of contaminants not selected for the quantitative Risk Assessment.

Methylene chloride (dichloromethane) does not present a practical risk of carcinogenesis at currently acceptable levels of exposure. Methylene chloride is considered to be the least toxic of the four chlorinated methanes. It has low to moderate acute oral toxicity in laboratory animals (Clayton, 1981). ECAO has not determined toxicity or carcinogenicity via ingestion; however, based on carcinogenic potency data via inhalation, methylene chloride is about one-fortieth (0.025) as carcinogenic as vinyl chloride. A draft acceptable daily intake value of 0.05 mg/kg-day has been proposed (USEPA, 1985); equivalent to an acceptable chronic intake level of about 1.8 ug/l. The observed average concentration of methylene chloride (about 0.08 ug/l) is less than one-twentieth of this level.

Trans-1,2-dichloroethene is reportedly currently under study by the National Cancer Institute; however, ECAO has made no determination of toxicity or carcinogenicity values. There is little data on the toxicity of individual cis- and trans- isomers. However, unpublished data on a 60:40 cis-trans mixture indicates low to moderate oral toxicity (Clayton). A recommended maximum contaminant level (RMCL; now MCLG) of 70 ug/l has been proposed (Federal Register, November 13, 1985); the observed concentrations at Ranney Well (1.8 ug/l) is well below this level. This non-zero recommended level implies the USEPA's current thinking that trans-1,2-dichloroethene is non-carcinogenic, since suspected carcinogens are assigned an RMCL of zero.

Trichlorofluoromethane (Fluorocarbon 11) demonstrated no evidence of carcinogenicity via ingestion in a National Cancer Institute study (Clayton, 1981). Trichlorofluoromethane is toxic via inhalation. Although there are no oral toxicity data, toxic health effects are not expected at the low concentrations present in Ranney Well water (0.08 ug/l).

Dichlorodifluoromethane (Fluorocarbon 12) is considered to be less toxic than trichlorofluoromethane due to the replacement of a chlorine atom by fluorine; however, there are no data on oral toxicity or carcinogenicity.

Tetrachloroethene (perchloroethylene) has been detected occasionally in samples from Ranney Well. However, no quantifiable detections have been reported within the most recent year. Although the literature conflicts with regard to carcinogenicity, USEPA (1985a) has assigned a carcinogenic potency value of 0.040 kg-day/mg, corresponding to a concentration of 0.87 ug/l for a 10^{-6} cancer risk. Due to the infrequency of detection and the low mean concentration (less than 0.04 ug/l for valid data since 2/85), no significant risk is posed by this compound.

1,1-Dichloroethene (1,1-DCE) is classified by EPA as a category II compound, indicating the evidence of carcinogenicity is equivocal. Therefore, as of now, a maximum contaminant level guideline (MCLG, formerly called recommended maximum contaminant level, RMCL) of 7 ug/l based on chronic toxicity data has been proposed. The average concentration for all data for 1,1-DCE (0.4 ug/l)

is less than one-tenth of this value; and 1,1-DCE has been detected only once in the last year. Therefore, no health effects are expected from current levels of 1,1-DCE.

Chloromethane (methyl chloride) is a gas at normal conditions; consequently, there is little data on ingestion of this compounds. USEPA (1980; cited in Sittig, 1985) evaluated chloromethane as a potential carcinogen, with a concentration of 0.19 ug/l corresponding to a 10^{-6} incremental cancer risk. However, this value was not specific to chloromethane, but applied to halomethanes as a class (which also includes methylene chloride and the trihalomethanes). Therefore, in the absence of specific data or values for chloromethane, it is not appropriate to quantify risk associated with this compound. The risk would be expected to be low, however, since chloromethane has only been detected in two of the sixty samples.

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4. CONCLUSIONS

The current treatment of Ranney Well water (by intercepting the most contaminated water at the purge well, and diffused air aeration of the Ranney water) is effective in reducing health risks associated with use of Ranney water.

The most reasonable scenario is to assume lifetime exposure to the average (mean) contaminant concentrations. Based on the 24.6×10^{-6} risk associated with lifetime exposure to the valid mean concentration, less than one (0.6) additional cancer can be expected in the exposed population of 21,000. This estimate of additional cancers should not be considered to be a prediction of cancer cases, but is presented to illustrate the order-of-magnitude health effects of existing Ranney contamination on the receptor population as a whole.

Risk assessment procedures call for calculating the increased (incremental) risk associated with exposure to the contaminants, in comparison to the risk associated with exposure to background (ambient) levels. The risks calculated previously assume that the ambient halocarbon concentration is zero. However, many water supply systems operate at or near the 100 ug/l allowable maximum contaminant level for total trihalomethanes (THMs) (Culp, 1984). Assuming a 100 ug/l THM concentration, and no other organic contaminants, the cancer risk is 20×10^{-5} . (This calculation is based on the same assumptions as for the actual Ranney Well data.) This is more than eight times greater than the risk associated with lifetime exposure to the valid mean concentration of Ranney contaminants.

Several qualifications must be placed on these cancer risk calculations. One is that there is no truly comparable data currently available; that is, only limited halocarbon (including vinyl chloride and THM) data was available for the other Endicott wells or for the communities in the area. This limited data on other Endicott wells does show THM concentrations to be low (3 ppb or less). Actual measurements of THMs and other halocarbons present in the water following fluoridation would be preferable. Ideally, this same data should also be available for the other Endicott wells.

However, due to the high carcinogenic potency of vinyl chloride, quantification of vinyl chloride concentrations at levels less than 1.0 ug/l is desirable. The laboratory currently being utilized (Friend Laboratory, Waverly, New York) does not achieve this. The current laboratory also seems to have trouble meeting the maximum allowable holding times consistently (more than 10% of the Ranney data was invalidated on this basis) although its performance appears to have improved recently. In addition to continuing the routine EPA Method 601 analyses, Ranney Well and purge well samples should be monitored periodically for the presence of other contaminants (i.e., those detected by EPA Methods 624 and 625 (GC) or CLP TCL volatiles and semi-volatiles) to verify the assumption that other pollutants are not a significant source of risk.

In addition to continuing the Ranney Well sampling, it may be useful to sample from end-user taps in order to determine if Ranney samples accurately reflect receptor exposures.

Work should continue to find and eliminate the source of organic contamination. Until vinyl chloride is consistently not detected in Ranney samples, the

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risk of additional cancer in the affected population remains. Finding and removing the source of contamination also reduces the risk of contaminating other wells and aquifers.

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5. REFERENCES

- Andelman, 1985. Inhalation Exposure in the Home to Volatile Organic Contaminants of Drinking Water. The Science of the Total Environment, 47 (1985) 443-460 (Amsterdam).
- Andelman et al., 1986. Volatilization of Organic Chemicals From Indoor Uses of Water. Published in Lester, Perry, and Sterritt, Eds., Chemicals in the Environment, Selper Ltd., London, 1986.
- Bishop, Bishop, & Rowan 1984. The Role of Skin Absorption as a Route of Exposure for Volatile Organic Compounds (VOCs) in Drinking Water. American Journal of Public Health, 74 (5). Cited in Versar 1986(a).
- Clayton, George D., and Florence E. Clayton (ed.), Patty's Industrial Hygiene and Toxicology, 3rd edition, John Wiley and Sons. New York, 1981.
- Code of Federal Regulations, 40 CFR 136, Clean Water Act, Appendix A.
- Code of Federal Regulations, 40 CFR 141, National Primary Drinking Water Regulations.
- Culp, Gordon (ed.), Trihalomethane Reduction in Drinking Water, Noyes Publications, Park Ridge, New Jersey, 1984.
- DeRosa, Chris, Ph.D., Environmental Criteria and Assessment Office, personal communication, December 1986.
- Ecological Analysts, Inc., Preliminary Investigation of the Village of Endicott Well Site, Town of Union, Broome County, New York, September 1984. Prepared for New York Department of Environmental Conservation, Albany, New York.
- ICF, 1985. Superfund Public Health Evaluation Manual (Draft). Prepared for Office of Emergency and Remedial Response, USEPA, Washington, DC.
- Kudgus, Eugene A. (Superintendent of Public Works, Village of Endicott, New York), Vinyl Chloride Contamination at the Ranney Well, March 1983.
- Mosteller, F., et al, Probability With Statistical Applications, Addison-Wesley, Reading, Massachusetts, 1970.
- Sax, N. Irving, Dangerous Properties of Industrial Materials, 6th edition, Van Nostrand Reinhold, New York, 1984.
- Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd edition, Noyes Publications, Park Ridge, New Jersey, 1985.
- USDHHS (United States Department of Health and Human Services), 1983, Public Health Service Third Annual Report on Carcinogens, National Toxicology Program, Research Triangle Park, North Carolina.
- USEPA, 1984, Guidance Document for Feasibility Studies Under CERCLA (Draft), USEPA Office of Emergency and Remedial Response, Washington, D.C.

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notice, it is due to the
quality of the document
being filmed

USEPA, 1985a, Superfund Public Health Evaluation Manual (Draft), Office of
Emergency and Remedial Response, Washington, D.C., December 1985.

USEPA, 1985b, Health Effects Assessments, Attachment I, Toxicity Values for
Use at Superfund Remedial Sites, July 1985.

USEPA, 1986, Guidelines for Exposure Assessment (Final), Federal Register 51
No. 185, Part VI, September 24, 1986.

Versar, 1986a. Superfund Exposure Assessment Manual (Draft). Prepared for
Office of Emergency and Remedial Response, Office of Solid Waste and En-
vironmental Response, USEPA, Washington, D.C. OSWER Directive 9285.5-1.

Versar, 1986b. Exposure Assessment for Perchloroethylene (Revised Draft).
Prepared for Exposure Evaluation Division, Office of Toxic Substances,
USEPA, Washington, DC. EPA Contract No.68-02-3968, Task 99.

END 002

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